NOTE: This practice exam covers some but not all the material from chapters 1-10 and is intended to be used as a resource for study. Please be sure to check the website (ucfsarc.wordpress.com/pcb-3703/) for more study materials or come to any of my sessions for additional help. Good luck studying!

1.Which of the following are features of the plasma membrane?
a) flexible lipid bilayer
b) separates cytosol from extracellular matrix
c) synthesizes secretory vesicles for exocytosis
d) made up of only phospholipids to act as a protective barrier against outside substances
e) all of the above
f) a & b only
g) a, b & c only

2. Phospholipids are amphipathic, meaning they are both hydrophilic and hydrophobic. What features of a phospholipid allow this behavior and how are these features oriented in the plasma membrane?
a) Phospholipids are arranged in a single layer in the cell membrane, where hydrophobic heads repel water and face the inside of the cell, and hydrophilic tails are water-loving and face the extracellular matrix.
b) Phospholipids are arranged in a double layer in the cell membrane, where hydrophobic tails of both layers face the inside of the cell and repel water, and hydrophilic heads of both layers face the extracellular matrix.
c) Phospholipids are arranged in a double layer in the cell membrane, where the hydrophilic heads of the outer layer of the membrane face the extracellular matrix and the heads of the inner layer face the cytoplasm. The Hydrophobic tails of both layers face each other on the inside of the bilayer.

3. What is the difference between Integral and peripheral membrane proteins?
a) Integral proteins are few in number and associated with Glycocalyx, while peripheral proteins cover the cell surface and are embedded through the plasma membrane.
b) Integral proteins are the most common proteins on the surface of the cell membrane and act as receptors, while peripheral proteins face the cytoplasm and associates with filamentous structures.
c) Integral proteins maybe embedded in a part of the lipid bilayer or pass all the way through it, while peripheral proteins never penetrate the lipid bilayer.
d) a & c only
e) b & c only

4. Which protein(s) are responsible for allowing vesicles from the Golgi apparatus to fuse to the plasma membrane, and which mechanism is this action a part of?
a) peripheral proteins take hold of the vesicle and pass it along to the integral proteins across the plasma membrane in a process called Facilitated Transport.
b) Actin filaments in the cytoskeleton allow vesicles to make a direct path from the Golgi to the plasma membrane, where tSNARE proteins uptake the vesicle to transport it across the cell membrane in a process called Passive Diffusion.
c) vSNARE proteins on the vesicle membrane surface bind with intracellular membrane-bound tSNARE proteins and allow for the fusion of both membranes in a process called Exocytosis.

5. A heritable disease causing a deficiency in glucocerebrosidase results in the accumulation of harmful substances in the cells and organ tissue of a 4-month-old infant, who presents with seizures and spasms, motor difficulties, enlarged liver and spleen despite low blood counts, and inability to fight respiratory infections. What is the diagnosis?
a) Tay-sachs
b) Gaucher's Type I
c) Aneuploidy
d) Gaucher's Type II

6. Which of the following is NOT a function or feature of the nucleus?
a) it's nuclear envelope is continuous with the lumen of the Smooth Endoplasmic Reticulum
b) directs the cell's functions for protein synthesis
c) produces ribosomes made of rRNA that are embedded along the lumen of the rough ER
d) contains chromosomes and chromatin composed of histone proteins and deoxyribonucleic acid
e) all of the above are functions of the nucleus

7. The regulation of gene transcription and extent of expression is controlled in chromatin by ____, a structure closely associated with the DNA double helix.
a) ribosomes
b) the nucleotide base pair sequence in DNA
c) mRNA
d) histone proteins

8. Aneuploidy is a family of conditions involving an abnormal number of chromosomes caused by:
a) monosomy as a result of abnormal alignment during Meiosis I
b) trisomy on chromosome 21
c) abnormal disjunction
d) both monosomy and trisomy of sex chromosomes

9. Which of the following can accelerate the process of aging:
a) free radical damage to cells
b) vitamin C & E
c) chemical pollutants
d) radiation therapy
e) all of the above
f) a & c only
g) a, c & d only

10. Benign and malignant tumors are _____, cell masses that divide and multiply abnormally.
a) metastasizing masses
b) oncogenes
c) neoplasms
d) encapsulated masses

11. _____ & _____ muscle tissues produce involuntary force and contractile movement in organs.
a) perineurium & transitional epithelium
b) simple cuboidal & myocardial
c) skeletal & peripheral
d) smooth & cardiac

12. Match the types of specialized protective tissue that surrounds the nerves with their function:

i___ thick outer sheath of connective tissue, blood vessels found within it.
ii___ loose, thin connective tissue layer that envelopes each individual nerve fiber.
iii___ penetrates into the nerve to envelop nerve fiber bundles, is penetrated by blood vessels.

a) endoneurium b) epineurium c) peripheral d) perineurium

13. The cells of myocardial tissue need a constant supply of Ca^{2+} ions for muscle contractions in the heart. The structure that allows the flow of Ca^{2+} in between cells is:
a) Sarcoplasmic reticulum vesicles
b) Desmosome
c) Gap junctions
d) Connective tissue

14. This secretory mechanism, found in axillary, pubic and sebaceous exocrine glands, requires it's cells to be in a constant state of mitotic divisions as it uses the entire cell as it's secretory vesicle and degrades the cell as a component of the secretory product.
a) exocytosis
b) apocrine
c) adhesion
d) merocrine
e) holocrine
f) both b & e are correct

15. Marfan syndrome typically presents with hypertension as a result of cardiomegaly, heart murmur, stretch marks, abnormally long limbs and fingers, and pain surrounding the joints. These conditions are the result of _____, affecting the gene that encodes _____.
a) a heritable genetic mutation on chromosome 21; elastin
b) an excess of nuclease enzymes; keratin
c) an autosomal dominant defect of chromosome 15; fibrillin-1
d) an X-linked genetic disorder; Collagen I & II

16. Which of the following are molecules within the interstitial space?
a) collagen fibers
b) polysaccharides
c) elastin
d) integrin
e) all of the above
d) a & c only

17. The flow of ions or molecules across the cell's plasma membrane down a concentration gradient, without the need for metabolic energy generation, is a type of transport called:
a) Osmosis
b) Facilitated Diffusion
c)Active Transport
d) Simple Diffusion
e) Passive Transport
f) all of the above
g) a, b, d, & e are all correct

18. Insulin acts as a _____, activating intracellular ____ to open channels for glucose to enter the cell in what type of passive transport?
a) cell surface receptor, GLUT4, simple diffusion
b) signaling molecule, Ach, active transport
c) signaling molecule, GLUT4, facilitated diffusion
d) cell surface transporter, K^+, passive diffusion

19. Parietal cells of the ____ secrete ___ into the lumen of the stomach, and what function does it serve?
a) GI tract, K^+, to establish a pH balance in the stomach
b) fundus, HCl, to convert pepsinogen into pepsin.
c) inner lining, H^+, to metabolize proteins
d) S.R., H^+/K^+, to degrade gastritis-causing Omeprazole molecules

20. What is the difference between primary and secondary active transport?
a) primary requires 1 molecule of ATP while secondary requires 2 molecules of ATP.
b) primary needs direct input of ATP while secondary is indirectly energized by membrane Na^+ gradient.
c) primary transports with gradients while secondary transports against gradients.
d) none of the above are true.

21. Glycosuria is a condition characterized by glucose within the urine as a result of:
a) Hypoglycemia, where glucose concentration of the blood and filtrate exceeds transport maximum
b) Hyperglycemia, where glucose concentration of the blood and filtrate exceeds transport maximum
c) Hypoglycemia, where glucose is reabsorbed into the blood and filtrate for transport
d) Hyperglycemia, where glucose is reabsorbed into the blood and filtrate for transport

22. An accumulation of fluid inside the cell and/or interstitial space is called ____, and can be caused by:
a) Inflammation, caused by cytokines IL-1 and TNF-a
b) Edema, caused by an Albumin deficiency in the blood
c) Reabsorption, caused by excessive uptake of H_2O in the collecting tubule
d) Edema, caused by congenital disorder or local injury to capillaries
e) all of the above
f) b & d are both correct

23. Match the ion with its equilibrium potential:

i_____ 45^{+}-65^{+}mv	a) Ca^{2+}
ii____ 120^{+} mv	b) Cl^{-}
iii____85^{-} mv	c) Na^{+}

24. In the neuro-muscular junction _____ is an enzyme, which degrades Acetylcholine into:
a) Protease, Acetylcholinesterase
b) Nuclease, acetic acid and chlorine
c) Acetylcholinesterase, acetyl-CoA and choline
d) Degradase, Acetlyacetate and chloride

25. A deficiency of _____ secretion from the brain stem's "black substance" may result in muscular tremors, difficulties with speech, disordered movement of limbs and digits, and the degeneration of neurons with D2 receptors.
a) Ca^{2+} and Mg^{2+}
b) Glutamate
c) Dopamine
d) Acetylcholine

26. Many diet fads such as juice cleansing or liquid diets cause individuals to fast from typical substance-based diets. Undergoing a diet like this over a long period of time may produce excessive ketone bodies that accumulate, resulting in:
a) gastritis in the lumen of the stomach
b) excessive energy production in the heart through the Krebs cycle
c) ketoacidosis, where the body's pH reaches dangerously acidic levels
d) Ketonuria, accumulation of ketone bodies in the urine

27. Galactose-1-phosphate uridyl transferase is an enzyme responsible for _____, and a deficiency in this enzyme results in intense dehydration, diarrhea, and a deficiency in electrolytes, symptoms of _____.
a) balancing Na^{+} & Ca^{2+}; Diabetes mellitus
b) degradation of galactose; Galactosemia
c) accumulation of galactose; Galactosemia
d) deficiency of galactose, Na^{+} & Ca^{2+}; Lactose intolerance

28. ____ is the precursor for Steroid production, which is the building block of:
a) Sterol, neurotransmitters
b) Cholesterol, testosterone & androgen
c) Sterol, Norepinephrine & Epinephrine
d) Cholesterol, Estrogen & Progesterone
e) a & c only
f) b & d only

29. Which of the following statements are true of enzyme catalysts?
a) they are a class of proteins
b) they are only present in digestive organs and glands
c) they increase the rate of biological reactions
d) they are not changed after a reaction
e) all of the above
f) all are true except for b

30. True or False: Glycogenesis is the mechanism of glucose-6-phosphate formation from glycogen via the enzyme glycogen phosphorylase in the liver.

31. Obstruction of blood flow by atherosclerosis, clots, or arterial spasms may cause intense pain radiating in the chest and down the left arm, shortness of breath, and rapid heart rate. This is due to _____, and is a condition referred to as _____.
a) decreased blood flow, Cardiomegaly
b) Hypercholesterolemia, Hypertension
c) decreased blood flow to the heart, Myocardial Ischemia
d) lack of oxygenated blood, Pleural Ischemia

32. Which of the following is NOT true of Oxidative Phosphorylation?
a) occurs in the cristae of the inner membrane of ribosomes
b) electrons are carried by coenzymes NADH & FADH
c) energy generated is taken up by ATP synthase
d) utilizes a proton pump
e) all of the above are true

33. Efferent postganglionic fibers of the Sympathetic Nervous System in the abdomen have their neuron cell bodies at their synapse at the _____, then synapse at _____.
a.) Sympathetic Chain Ganglia; Abdominal Ganglia on target organ tissue
b.) Abdominal Ganglia; Celiac Ganglion
c.) Sympathetic Chain Ganglia; Superior & Inferior Mesenteric Ganglia
d.) Abdominal Ganglia; target organ tissue

34. What kind of efferent fibers and receptors of the Sympathetic Nervous System are responsible for stimulating and receiving the signal for secretion of epinephrine and norepinephrine from Chromaffin cells?
a.) Postganglionic fibers; α2 Adrenergic receptors
b.) Preganglionic fibers; Nicotinic receptors
c.) Postganglionic fibers; Cholinergic receptors
d.) Preganglionic fibers; α2 Adrenergic receptors
e.) Postganglionic fibers; Muscarinic receptors

35. Which of the following receptors can be found in the neuromuscular junction? **[select all that apply]**
a.) α2
b.) Nicotinic
c.) β1
d.) α1
e.) Muscarinic
f.) β2
g.) all the above
h.) none of the above

36. What portion of the Central Nervous System would be responsible for signaling the Sympathetic α1 and β2 receptors to inhibit urination?
a.) Medulla
b.) Apneustic Center
c.) Midbrain
d.) Pons
e.) Hypothalamus

37. A patient arrives in the ER exhibiting a slow heart rate, sweating, fatigue, diarrhea, polyuria, excessive salivation, and a wet cough. Symptoms seem to be worsening over time. After speaking with the patient's family, they reveal they had been camping in the national forest nearby and the patient had recently ingested some mushrooms scavenged from the forest. Luckily, the patient's family brought the mushrooms in a plastic bag and after some investigation it is revealed that this particular species contains toxic amounts of muscarine. What treatment option is most appropriate for the patient?

a.) Propranolol
b.) Albuterol
c.) Atropine
d.) Neostigmine
e) none of the above, there is no hope for this patient

38. Which of the following cranial nerves are involved in Parasympathetic Nervous System innervation? **[select all that apply]**
a.) Trigeminal Nerve
b.) Oculomotor Nerve
c.) Abducens Nerve
d.) Facial Nerve
e.) Vagus Nerve
f.) Pelvic Splanchnic Nerve
g.) Glossopharyngeal Nerve
h.) none of the above

39. Which of the following cranial nerves is the principle nerve for Parasympathetic Nervous System innervation of the gastrointestinal tract?
a.) Trigeminal Nerve
b.) Oculomotor Nerve
c.) Abducens Nerve
d.) Facial Nerve
e.) Vagus Nerve
f.) Pelvic Splanchnic Nerve
g.) Glossopharyngeal Nerve
h.) none of the above, there is no principle nerve for GI stimulation

40. Gustatory receptors of <u>efferent</u> sensory nerve fibers belong to the Peripheral Nervous System
a.) True
b.) False
c.) not enough information is available to come to a conclusion

41. At which order of sensory neuron does an incoming signal taking the Anterolateral pathway become contralateral?
a.) 2nd order in the medulla
b.) 3rd order in the Thalamus
c.) 2nd order in the Thalamus
d.) 3rd order in the spinal cord nucleus Gracilis
e.) 2nd order in the spinal cord
f.) both A and C
g.) both A and E
h.) both C and E
i.) none of the above

42. Mechanoreceptors that send signals along the Anterolateral Somatosensory pathway are **[select all that apply]**:
a.) phasic
b.) pacinian corpuscles
c.) A-α
d.) tonic
e.) A-γ
f.) none of the above

43. Which nerve has its second order synapse at the Geniculate ganglion in the Gustatory System?
a.) CN VII
b.) CN V3
c.) Chorda tympani
d.) CN IX
e.) none of the above
f.) B & C
g.) A & C

44. Chemoreceptor cells in the olfactory system are specialized epithelial cells that transduce signals to Mitral cells.
a.) True
b.) False

45. Ciliary bodies of the Iris secrete an aqueous humor in the eye, which eventually drains through the _____, a foramen that connects to the venous system of the _____ layer.
a.) Lacrimal duct; Sclera
b.) Canal of Schlemm; Retinal
c.) Intraocular foramen; Sclera
d.) Canal of Schlemm; Choroid
e.) none of the above

46. Which of the following portions of the Retina are devoid of light-sensing photoreceptors?
[select all that apply]:
a.) Optic disk
b.) Bipolar cells
c.) Fovea Centralis
d.) Amacrine cells
e.) both A & C only
f.) all of the above

47. What is the cause and effect of hyperpolarization in Horizontal cells due to a decrease in cyclic guanosine monophosphate concentration in Rod cells?
a.) excitatory neurotransmitter stimulation; sight
b.) inhibitory neurotransmitter stimulation; sight
c.) excitatory neurotransmitter stimulation; no sight
d.) inhibitory neurotransmitter stimulation; no sight
e.) not enough information is given to reach a conclusion

48. A patient presents with acute vision loss in the right eye following a crash that left them with multiple facial bone fractures, but an uninjured eyeball. What is the most likely cause of damage, and where is it located?
a.) severing of the right branch of CN II
b.) damage to left lateral geniculate nucleus
c.) damage to left & right geniculo-calcarine tract
d.) nasal field damage to optic tract
e.) none of the above

49. The cell bodies of first order CN VIII neurons are located where?
a.) basilar membrane
b.) scala media
c.) spiral ganglion
d.) scala tympani
e.) cochlear nerve
f.) Dorsal & Ventral nuclei

50. Angular acceleration stimulus in the semicircular canals is received by _____, and redirects motor innervation to extraocular muscles via neurons in the _____:
a.) Medial & Superior Vestibular nuclei; Medial Longitudinal fasciculus
b.) CN VIII; Lateral Vestibular nucleus
c.) Inferior Vestibular nucleus; Spinal cord oculomotor neurons
d.) Medial & Superior Vestibular nuclei; Cerebellum

51. The Reticulo-spinal tract pathway of the Vestibular system **[select all that apply]**:
a.) stimulates β motor neurons in the skeletal muscle for stretching
b.) stimulates α sensory neurons in the skeletal muscle for contractions after stretching
c.) has γ sensory neurons in the skeletal muscle in contact with motor nerves via inter-neurons to stimulate contractions after stretching
d.) stimulates α motor neurons in the skeletal muscle for contractions after stretching
e.) A & B only
f.) none of the above

52. Damage to the lateral vestibular nucleus in the Medulla inhibits synapse between the utricle's afferent neuron and the spinal cord's efferent motor neuron; what is the physiological result? **[select all that apply]:**
a.) lack of extraocular muscle reflex upon angular acceleration
b.) lack of postural reflex in extensor muscles of the upper & lower limbs
c.) lack of interneuron stimulation which inhibits muscular contractile reflex after stretching
d.) lack of postural reflex inhibition in flexor muscles of the upper & lower limbs
e.) none of the above

53. Which of the following phagocytic neuroglial cells belong to the CNS?
a.) Satellite cells
b.) Microglia
c.) Oligodendrocytes
d.) Astrocytes
e.) both B & C
f.) B, C, & A
g.) both B & D

54. Which of the following hormones stimulates the pituitary secretion of Adrenocorticotropic Hormone (ACTH) into circulation, and what is the target tissue receiving ACTH?
a.) CRH; Adrenal Medulla
b.) Leptin; Adrenal Cortex
c.) Cortisol; Adrenal Medulla
d.) CRH; Adrenal Cortex
e.) Leptin; Adrenal Medulla
f.) both B & D
g.) both A & C

55-62, Match the following terms with their most appropriate description:

55. Nitric Oxide:
56. Microglia:
57. Schwann cells:
58. Ependymal cells:
59. Neurons:
60. Satellite cells:
61. Oligodendrocytes:
62. L-Dopa:

a.) active during immunological responses in the CNS
b.) found in dorsal root ganglion, dorsal horn of the spinal cord gray matter, and in sympathetic chain ganglia
c.) vasodilates the dorsal vein of the penis for an erectile response
d.) able to cross the blood-brain-barrier
e.) facilitate the circulation of CSF in the ventricles of the brain
f.) form myelin sheaths around central axons
g.) unable to replicate or divide once developed
h.) form myelin sheaths around peripheral axons

63. Which of the following are functions of skeletal muscle tissue? **[select all that apply]:**
a.) stabilization of joints
b.) generation of body heat
c.) movement of the bones
d.) Peristalsis
e.) none of the above

64. Which of the following is INCORRECT regarding intrafusal fibers?
a.) they are afferent fibers that relay sensory stimulus to the dorsal horn motor neuron cell bodies
b.) they relay vibration stimulus via Pacinian corpuscle group II fibers
c) they run parallel to extrafusal fibers of the skeletal muscle
d.) they relay deep stretch stimulus via Muscle Spindle group Ia & II fibers
e.) all of the above are correct statements

65. Skeletal muscle contraction is mainly stimulated by _____, while smooth muscle contraction is mainly stimulated by _____:
a.) Epinephrine; Calcium
b.) Norepinephrine; Acetylcholine
c.) Troponin-C; Norepinephrine
d.) Acetylcholine; Norepinephrine

66. Which of the following is the main post-synaptic cell surface receptor that receives the neurotransmitter stimulus to contract skeletal muscle in the neuro-muscular junction?
a.) Adrenergic
b.) Cholinergic
c.) Nicotinic
d.) Muscarinic
e) both A & B
f.) both B & C

67. The calcium needed by muscle cells to undergo a muscular contraction is supplied by calcium ion channels.
a.) True
b.) False

68. In which of the following portions of a resting sarcomere can we expect to find thick filaments? **[select all that apply]:**
a.) H band
b.) A band
c.) Z-line
d.) I band
e.) M-line
f.) all of the above

69. What occurs if calcium is absent in a muscle cell following a contraction stimulus?
a.) Troponin-C activates conformational changes in Tropomyosin that allow Myosin to bind to Actin
b.) Troponin-T activates conformational changes in Tropomyosin that inhibit Myosin from binding to Actin
c.) Tropomyosin blocks the Myosin binding site on the Actin filament
d.) none of the above

70. A single motor unit is composed of a single motor neuron in the dorsal gray matter of the spinal cord and all the muscle fibers it innervates.
a.) True
b.) False

71. Which of the following statements regarding Duchenne Muscular Dystrophy is INCORRECT?
a.) It is a recessive genetic disorder
b.) The mutated gene responsible is X-linked
c.) the disorder typically manifests in children 2-10 years of age
d.) the disorder is a myopathy characterized by dystrophin deficiency
e.) all of the above statements are correct

72. Which of the following are features of skeletal muscle cells? **[select all that apply]:**
a.) a single cell is multinucleated
b.) cells contain gap junctions to easily transport Ca^{2+} between neighboring cells during a contraction stimulus
c.) cells are spindle-shaped
d.) cell nuclei are centrally located
e.) cells are striated differently depending on the stage of contraction or relaxation
f.) are extrafusal fibers

ANSWER KEY ON THE NEXT PAGE

ANSWER KEY:

1F	11D	21B	31C
2C	12 iB, iiA, iiiD	22F	32A
3E	13C	23 iC, iiA, iiiB	33D
4C	14E	24C	34B
5D	15C	25C	35G
6C	16E	26C	36C
7D	17G	27B	37C
8C	18C	28F	38BDEG
9G	19B	29F	39E
10C	20B	30False	40B

41H	51CD	61F	71C
42AB	52BD	62D	72AEF
43G	53G	63ABC	
44B	54D	64A	
45D	55C	65D	
46ABD	56A	66C	
47C	57H	67B	
48A	58E	68ABE	
49C	59G	69C	
50A	60B	70B	